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Smart Systems for Logistics Command and Control (SSLC2): Virtual Space Logistics Readiness Center (VSLRC) Living Laboratory

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The Virtual Space Logistics Readiness Center (VSLRC) Living Laboratory was developed to provide Air Force Space Command (AFSPC) users with a consistent understanding of space system operational, equipment, communication, and logistics status. Cognitive Task Analysis was accomplished through interviews with AFSPC users to storyboard weapon system core screens. Through user interface design and visualization techniques, users were provided with an intuitive display of information which requires no user training. Each core screen was designed and developed in accordance with the storyboards to include the capability for users to manually update operational, equipment and communications status to identify impacts of logistics actions on operations.

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ABSTRACT

The Virtual Space Logistics Readiness Center (VSLRC) Living Laboratory was developed to provide Air Force Space Command (AFSPC) users with a consistent understanding of space system operational, equipment, communication, and logistics status. Cognitive Task Analysis was accomplished through interviews with AFSPC users to storyboard weapon system core screens. Through user interface design and visualization techniques, users were provided with an intuitive display of information which requires no user training. Each core screen was designed and developed in accordance with the storyboards to include the capability for users to manually update operational, equipment and communications status to identify impacts of logistics actions on operations.

For satellite constellations, operational status information was obtained through a direct interface with the Mission Critical Reporting System (MCRS). This demonstrated the technological ability to receive near real-time data interfaces from source systems which provide the user with automatic status updates, and created a baseline for additional future technological advances in intelligent agent alert systems and additional source system interfaces.

Design and development efforts also provided AFSPC users with the ability to post required critical briefing materials such as Quarterly Sustainment Reviews, weekly Production Meetings, and daily Situation Reports to provide users with the most updated information that would assist in data analysis and status reporting.

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1 Summary

The goal of this research is to develop technology that provides critical information about space systems to the warfighter.

The Virtual Space Logistics Readiness Center (VSLRC) Living Laboratory is an interactive system designed to provide increased decision support to the space systems warfighter by providing access to near real-time system operational and equipment status, and linking logistics data to its impact on operational readiness. It was developed to provide an array of Air Force Space Command (AFSPC) users (System Sustainment Managers (SSMs), Combatant Commanders, Logistics Readiness Officers, Equipment Specialists, Operators, etc.) with the ability to automatically view and update current operational, system, and communication status of space systems. From initial design through final acceptance, during each incremental software design and development phase, users have driven the input into VSLRC's technological capabilities. This allows for further implementation of relevant user requirements and collaborative capability deployment.

2 Introduction

This report provides in detail the research, analysis, design, development and implementation efforts required and utilized for the VSLRC. Although the VSLRC Software Requirements Specification Document (CDRL A007, under separate cover) identifies the user requirements in detail; this document provides a high level summary of requirements (Section 3.2) and outlines how they were satisfied along with the associated methodologies utilized to achieve them.

2.1 PURPOSE

A typical Logistics Readiness Center (LRC) is normally a center designed to provide information on logistical status and operational impact to weapon systems. However, they tend to be manpower intensive and consist of various personnel in individual roles who receive information manually through phone, facsimile or electronic mail. This method of gathering information requires a high level of collaboration and is not typically proactive, but reactive, and relies on lagging versus leading indicators to display status. Also, efforts tend to be focused on updating only the Logistics Group (LG)/Command Post, rather than informing all relevant decision makers in a timely manner.

The vision of a VSLRC is to develop a center designed to provide information on logistical status and operational impact to weapon systems, and to apply research technologies to make that center web-based through an information portal that provides near real time information as well as links with other status and analysis tools. The VSLRC is role-based, and eventually will allow specific users to identify business rules, parameters and thresholds in order to utilize flags and apply alerts when breaches in those identified thresholds have occurred and real or potential problems exist. Its purpose is to enable users to be informed and proactive. With these capabilities, a VSLRC could be applied to multiple users throughout AFSPC.

Key targeted users include:

- Commanders
- Logistics Readiness Managers

- Numbered Air Force (NAF)/Wing Level Operators
- Program Directors
- Supply/Maintenance (Mx) Personnel
- Operations Center
- Sustainment Managers

2.2 SCOPE

The scope of this effort relative to the development of a VSLRC included the following tasks:

- Analyze stakeholder requirements for core screen storyboard design through interviews and functional analysis.
- Identify data sources and business rules required for data collection.
- Identify hardware and software infrastructure requirements, including the integration with the Single Integrated Space Picture (SISP), Combatant Commander Integrated Command and Control System (CCIC2S) and the USSTRATCOM Strategic Decision Support System (SDSS).
- Identify data sources required for source system interfaces and required methodology for obtaining data.
- Provide a capability for users to post and view briefing materials and reports.
- Analyze, design and develop an interface to the Mission Critical Reporting System (MCRS) to display and update operational status information for select weapon system satellite constellations.

2.3 BACKGROUND

In a previous feasibility assessment for the VSLRC, key stakeholders identified that AFSPC required a means to increase support to the space systems warfighter by providing access to near real-time system operational and equipment status, and by linking logistics data to its impact on operational readiness. The assessment indicated that the VSLRC should integrate all necessary logistics, maintenance, and operations data into a single system that decision-makers can easily use to identify, diagnose, and take corrective actions to solve logistics issues in the space systems' supply chains.

The VSLRC is a web-based system which operates within a portal-like environment that adheres to Air Force and Department of Defense (DoD) interoperability standards. Initially, the VSLRC is housed in a secure environment (i.e., Secure Internet Protocol Network (SIPRNET)), but it will eventually transfer information between classified and unclassified environments for ease of use. This will also allow data exchange between the Air Force Knowledge Service (AFKS) and other source data systems.

2.4 DOCUMENT OVERVIEW

This VSLRC Final Report details the Methods, Assumptions and Procedures used in design of the VSLRC (Section 3); along with Conclusions (Section 5) and Recommendations (Section 6). A list of References is provided in Section 7. Appendix A includes a Guide to Symbols, Abbreviations and Acronyms.

3 Methods, Assumptions, and Procedures

3.1 COGNITIVE TASK ANALYSIS

Cognitive Task Analysis (CTA) is a family of methods and tools for gaining access to the mental processes that organize and give meaning to observable behavior. CTA methods describe the cognitive processes that underlie performance of tasks and the cognitive skills needed to respond adeptly to complex situations.[1] CTA methods were used during the interview process of key stakeholders for the design of weapon system core screen storyboards. The following figures (3.1 through 3.11) show the weapon system core screens that resulted from this analysis, storyboards, design and development.

Based upon user input, general features common to the VSLRC screens include:

- Ability for users to easily view/select weapon systems by organization.
- Ability for users to easily view/select weapon systems by type.
- Ability for users to easily view/select information by site.
- Status indicators presented directly above related equipment icons.
- Easy visualization of geographic references.
- Simple status indicators (yellow, green, red).
- Equipment status icons, including Estimated Time of Return to Operations (ETRO) days.
- Clear labels on status indicators, equipment, etc.

Additional detail regarding the core screens and functionality can be found in CDRL A008, The VSLRC Software User Manual.

3.1.1 Air Force Satellite Control Network (AFSCN)

Attention to detail in screen design was the key to optimizing presentation. Screens were designed to display all Operational Capability (OPSCAP), Equipment and Communication status icons. They also display mobile equipment items that appear to the side of each location, which can be relocated to be the responsibility of another location within that weapon system. (See figure 3-1 below).

[1] Paul Salmon, Prof Neville Stanton, Dr Chris Baber, Dr Guy Walker, Dr Damian Green; Defense Technology Center Publication , “Human Factors Design & Evaluation Methods Review”

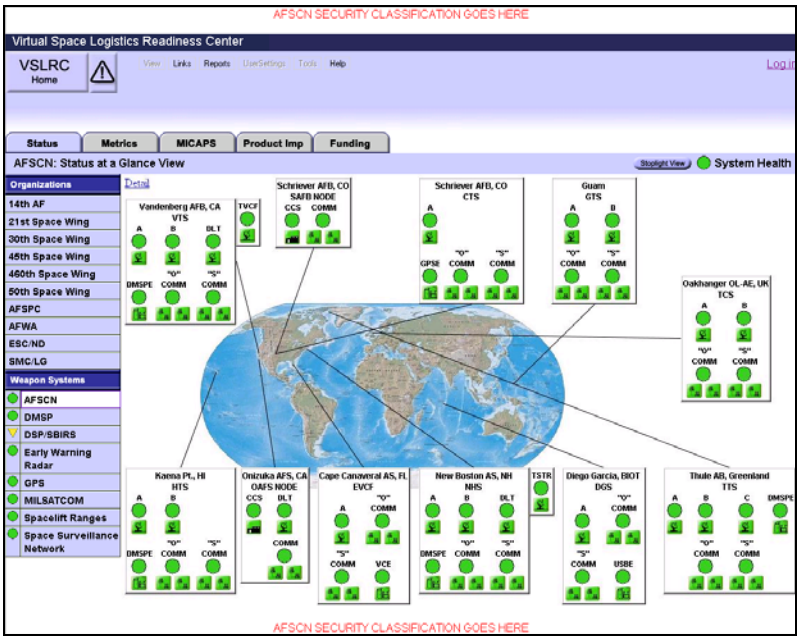

Figure 3-1 AFSCN

3.1.2 Defense Meteorological Satellite Program (DMSP)

The DMSP status displays were common in the visual presentation of OPSCAP, Equipment and Communication status. Functional representations had to be tailored based on user requirements. (See figures 3-2 for the Ionospheric Measuring System (IMS) core screen, figure 3-3 for the Make SVB Meteorological Data Station/Remote Sensing Station (MKIVB/RSS) core screen and figure 3-4 for the Solar Electro-Optical Network (SEON) for core screen view).

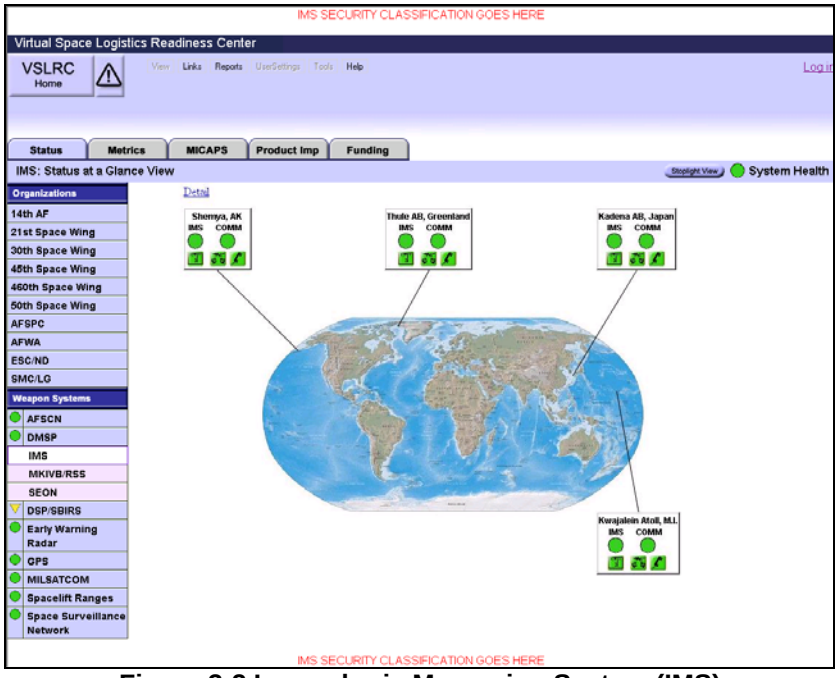

Figure 3-2 Ionospheric Measuring System (IMS)

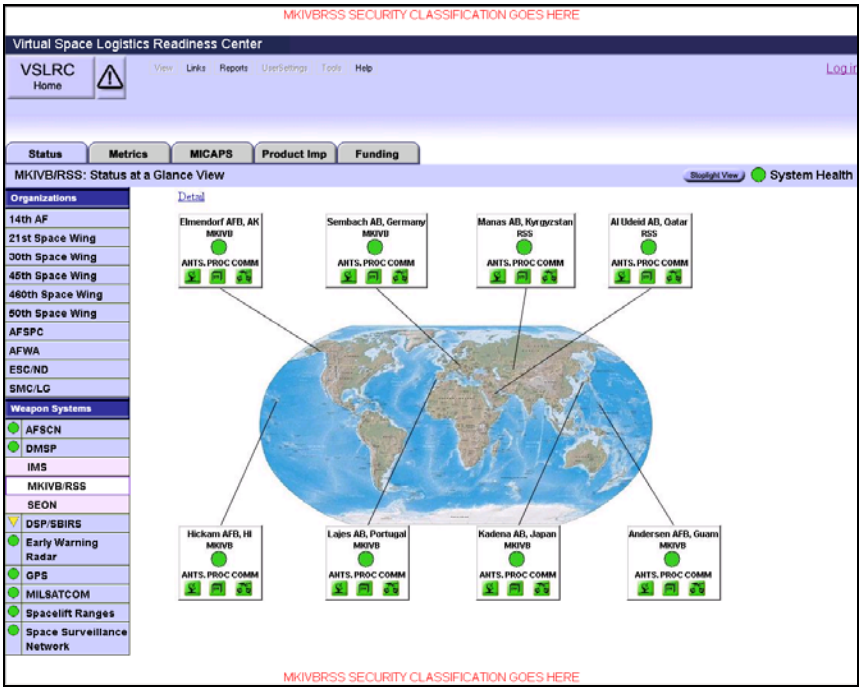

Figure 3-3 Make SVB Meteorological Data Station/Remote Sensing Station (MKIVB/RSS)

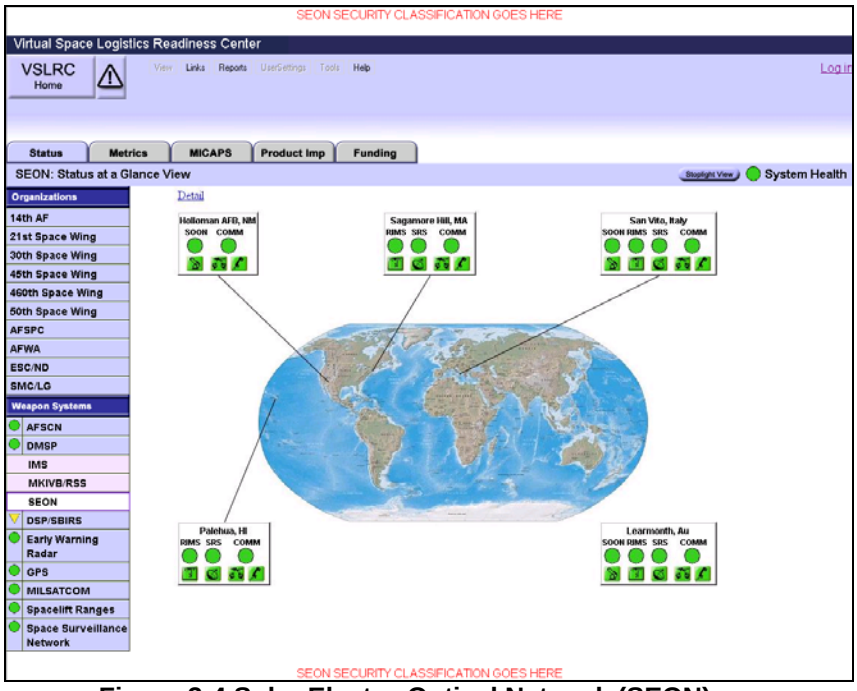

Figure 3-4 Solar Electro-Optical Network (SEON)

3.1.3 Defense Support Program /Space Based Infrared System (DSP/SBIRS)

Two additional functional complexities were added within the DSP/SBIRS core screen visualization. The first included a multi-count display for equipment components. Multi-Count OPSCAP and equipment components are represented by the number displayed on top of the equipment icon (Figure 3-5).

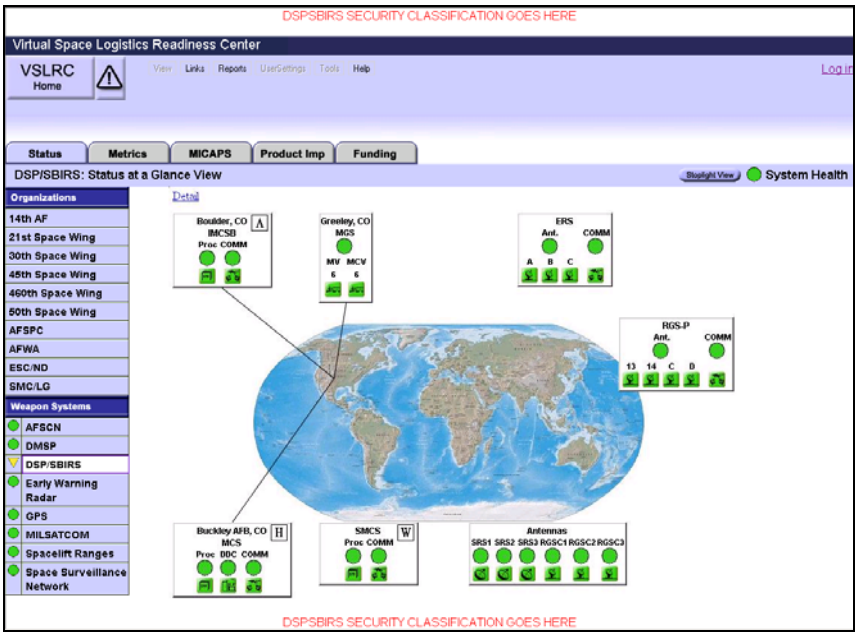

Figure 3-5 DSP/SBIRS

3.1.4 Early Warning Radar

Within Early Warning Radar, sites have various coverage areas so as to be able to support other locations during an outage. When the mission of a coverage area is degradated in any means (e.g. Partially Mission Capable (PMC) or Non Mission Capable (NMC)), the color shading of the particular coverage area will change color as a visual indicator to the user that there is a break in service for that location. This display also helps the user to see what contributing or collateral areas are being utilized in support of others so that they can more efficiently and effectively take decisive action.

3.1.5 Global Positioning System (GPS)

The GPS weapon system introduced the need for a visual display of status between multiple equipment strings (e.g. Cape Canaveral Transportable Ground Antenna (TGA) and Ground Antenna (GA)) (Figure 3-6). Each string had to have a separate manual update capability and separate days reported to return to operation if the equipment items were other than Fully Mission Capable (FMC).

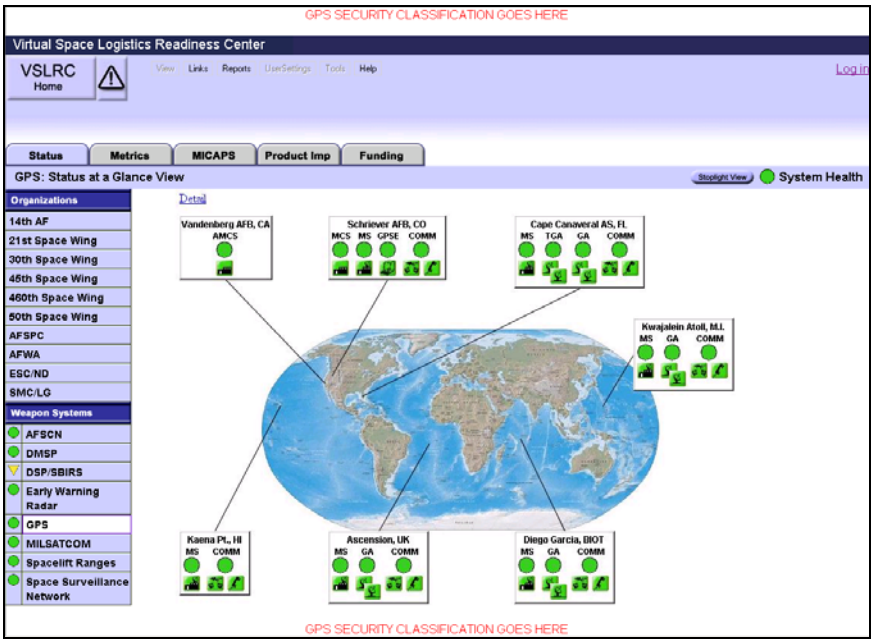

Figure 3-6 GPS

3.1.6 Military Satellite Communications (MILSATCOM)

3.1.6.1 Defense Satellite Communications System (DSCS)

Information pertaining to DSCS had to be configured and displayed in a manner to optimize the users' ability to see all satellite status data with a status box and simultaneous display of the satellite on the globe itself. Additional complexities exist with the ability to display multiple OPSCAPs for a component and multi-count displays for OPSCAP, which were represented by a number beside the OPSCAP component. Hierarchical database design relationships were established to facilitate this display.

3.1.6.2 Global Broadcast Service (GBS)

The GBS weapon system introduced the visual display of "inactive" components. These components had to appear to the user with a different shape and white color shading to distinguish them from the other status displays.

3.1.6.3 Military Strategic and Tactical Relay System (MILSTAR)

The MILSTAR weapon system involved displaying weather information for select locations. The user would have the ability to manually update weather information with pick lists provided.

3.1.7 Single Channel Transponder System (SCTS)

The SCTS display utilizes visualization techniques similar to those used for Defense Satellite Communications System (DSCS).

3.1.8 Spacelift Ranges

The standard visualization techniques were also used for spacelift ranges. They can be seen in the two figures below (Figures 3-7 and 3-8).

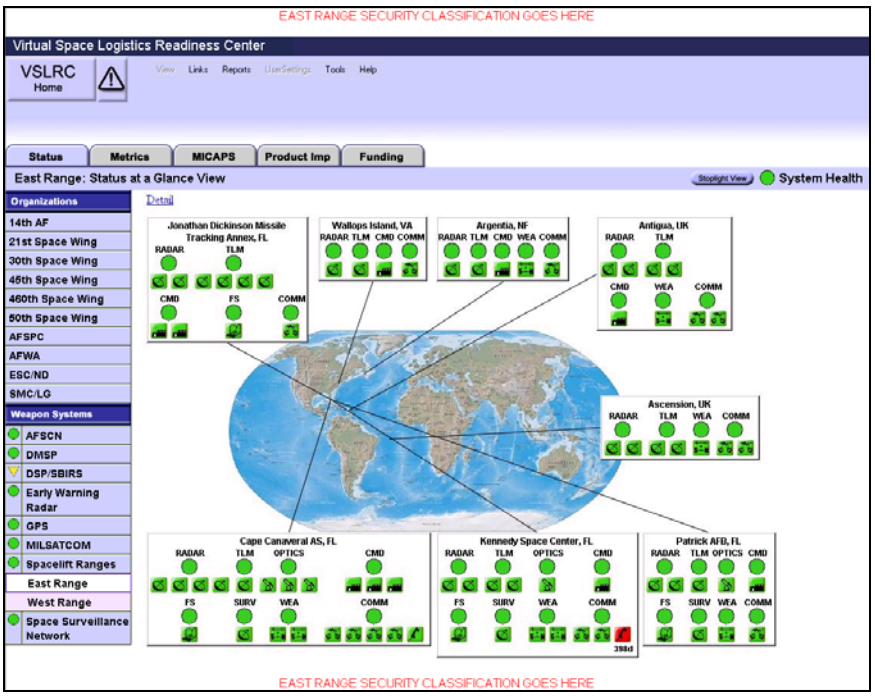

Figure 3-7 Spacelift East Range

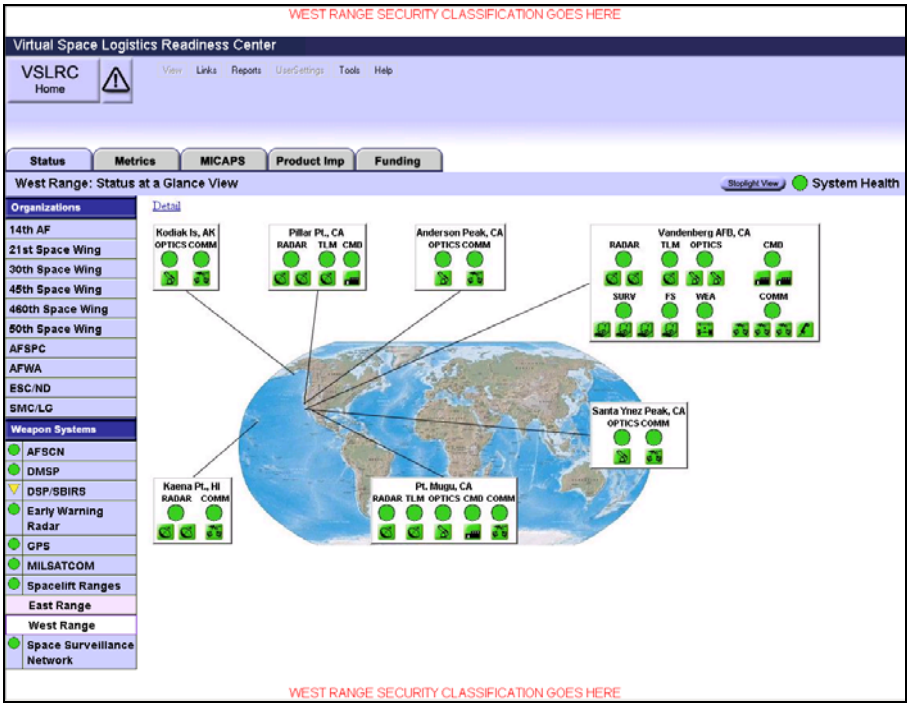

Figure 3-8 Spacelift West Range

3.1.9 Space Surveillance Network (SSN)

The AF Fence consists of various components identified with a horizontal line on the core screen and various equipment components labeled with the capital letter of their equipment type (Figure 3-9). As with all other VSLRC screens, it also includes all of the other standard VSLRC visualization features.

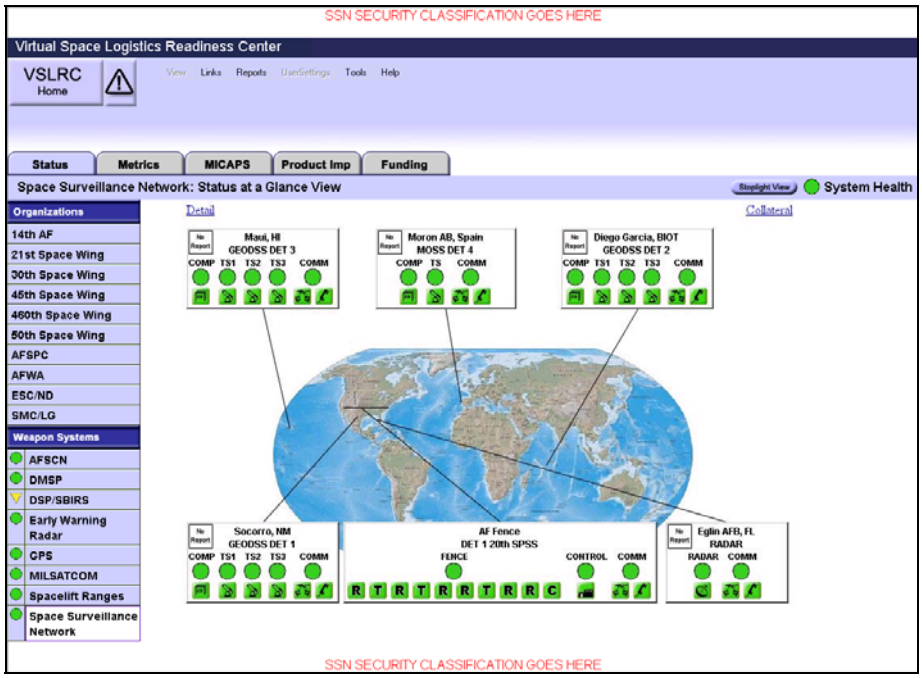

Figure 3-9 SSN

3.2 REQUIREMENTS

Requirements for each VSLRC software release were documented within IBM Rational Requisite Pro® and tracked through a Requirements Traceability Matrix (CDRL A0007, Software Requirements Specification) to ensure the software design, development, testing and integration efforts were completed and complied with throughout the Software Development Life Cycle (SDLC). Use cases were developed for requirements to validate the design and mitigate risk throughout the SDLC. A database Entity Relationship Diagram (ERD) was also created in order to manage functional relationships and dependencies within the software design.

A high-level summary of requirements by software release includes the following:

Table 1: VSLRC Requirements

VSLRC Software Release	Requirement
Web update Deployment 1 Oct	
	VSLRC core screen developed
	Navigation pane for application
	Weapon system buttons to be active and identify "Under Construction"
	Active menu bar (Reports, Help)
	Ability to post reports (Situational Reports (SITREPs), Quarterly Sustainment Reviews (QSRs), Production Mtngs, Chief Sustainment Officer (CSO) Contact Info)
	Ability to upload existing reports
	Weapon System Detail Reports
	Organizations buttons active and go to map with location of each organization identified
	Help menu created (Support and Release Info)
	Upload button for each report
VSLRC Release 2.0.0.0	
	Weapon system core screens created with equipment icons
	Manual Status Updates (Role-based)
	Ability to view history of status changes added
	Ability to enter comments added
	Acronym list added
VSLRC Release 2.1.0.0	
	Links Menu with Uniform Resource Locators (URLs) Added
	Modify .Txt File to Allow Classification Changes from the Console By Weapon System
	Modify Estimated Time to Completion (ETIC) Field to Incorporate DD/MM/YYYY
	Modify ETIC to Incorporation UNKNOWN Entry

VSLRC Software Release	Requirement
	Remove Login and Logout function
	Lowest Computer display Setting (Resolution) 640x480
VSLRC Release 3.0.0.0	
	Add user remotely-using current configuration
	Ability to modify security classification remotely
	Stoplight View for each weapon system added
	Operations Capability (OPSCAP) Data transfer from Mission Critical Reporting System (MCRS)
	Remove the Digital Ionospheric Sounding System (DISS) Weapon Screen
	Minor Enhancements

3.3 SOFTWARE DESIGN

The VSLRC was originally planned to be integrated with the SISP to ensure scalability and interoperability demands were met and to decrease duplicative efforts. SISP is a comprehensive peacetime/wartime situational awareness capability, which enables joint warfighters at all levels to integrate space effects, capabilities, statuses and vulnerabilities into military operations. However, due to implementation challenges with SISP, the VSLRC was hosted on the STRATCOM SDSS at Peterson AFB, CO.

The design of the VSLRC application is web based with an ultra-thin client profile. This means that the VSLRC user needs only an internet browser installed on their local laptop or desktop and a connection to the SIPRNET to use the system. To accomplish this goal, the VSLRC is designed as a Java 2 Platform, Enterprise Edition (J2EE) application with no reliance on plug-ins (such as the Java Runtime Environment (JRE)) for applets, and with minimal reliance on JavaScript. The J2EE Platform defines the standard for developing multi-tier enterprise applications. By following these standards VSLRC takes advantage of J2EE applications servers, like JBoss.org's JBoss application server, which implement the J2EE specification, thereby allowing developers to focus on the application specific code and more rapidly develop an enterprise application.

Role-based authentication was used in order to allow users with certain roles (e.g. base, wing, SSM, Commander, etc.) to view information, perform certain actions and receive alert notifications based on their particular areas of responsibility and interests.

The following Commercial Off-the-Shelf (COTS) products are required for VSLRC:

- Oracle 9.2.0.1 - Relational Database Management System (RDBMS)
- JBoss 4.0.1SP1 – A 100% pure Java J2EE Application Server
- Java Development Kit (JDK) 1.4.2 – Provides the Java Virtual Machine (JVM) to run JBoss. Also provides a Java compiler to compile Java Server Pages (JSPs) at runtime, and other tools such as the keytool to manage Secure Sockets Layer (SSL) certificates and the jar tool to enable packaging and unpackaging Java Archives (JARs), Enterprise Archives (EARs) and Web Archives (WARs).

- JavaService 1.2.4 – Allows JBoss to be installed as a Windows service thereby enabling auto startup when the server is rebooted.
- iPlanet Directory Server v5.1, SP2 - Provides LDAP Security services (or another LDAP server). Note, although iPlanet is available on SDSS, it is currently not being used for VSLRC authentication and authorization. That function is now being handled through JBoss using a Java Authentication and Authorization Service (JAAS) Login Module to access authentication and authorization information stored in the database.

Preliminary Design Reviews (PDRs) and Critical Design Reviews (CDRs) were accomplished throughout key phases of software design to ensure customer requirements and implementation methodologies met.

3.4 CONFIGURATION MANAGEMENT PROCESS

The management of risk is a critical part of successful program management. Specialized techniques for dealing with risk are known collectively as risk management. A Microsoft Sharepoint® collaborative workspace was used to identify potential risks to the VSLRC Program, assess impacts of risk probabilities, and determine strategies for mitigation and monitoring of risks. All significant risks and critical issues were identified for the program and reviewed during periodic progress reviews.

3.4.1 Configuration Management

The VSLRC team utilized the Rational Unified Process® (RUP) as an iterative software development tool, from requirements generation through test and deployment. Rational's Requisite Pro® and DOORS were used to enter all requirements and develop/manage the Requirements Traceability Matrix (RTM). Rational's ClearQuest® was used to generate all help desk problem reports, Enhancement Requests (ERs), Software Problem Reports (SPRs) found during testing, Discrepancy Reports (DRs) and Document Changes (DCs). Reports were generated on each of these items and reported within the monthly status reports. Rational's ClearCase® was used to house all code modifications, use cases and other development products. Test Manager was used to interrelate the test scripts with the requirements and test plans.

3.4.2 Quality Assurance

Implementing effective quality assurance procedures in all stages of software development was critical. Peer reviews, senior management reviews, and editorial reviews of preliminary and interim draft documents were essential. Review of products or services at every stage of the project process ensured the product met required specifications. Peer reviews were required to identify errors early in product development. Software was verified to operate without crashes, performs per the specification, and met the stated objectives. Computers were scanned with detection software to ensure secure electronic file transmission.

4 Results and Discussion

The various visualization techniques used to display both core screens and status displays were proven to be very effective to users and allowed the VSLRC to require no user training. Selection of weapon systems and organizations proved to be very effective. The clear status

display of weapon system components (Red = Octagon = NMC, Yellow = Upside Down Triangle = PMC, Green = Circle = FMC) enhanced the user's decision making process and situation awareness.

Manual status updates were accomplished in a timely manner and users were able to efficiently view and enter data for the various weapon systems. The additional stoplight view enables the users to further drill-down into the level of detail necessary and aggregate the information according to individual needs. Views can be saved, uploaded and seen on a recurring basis in order to tailor the display of data to the user's organization, role and weapon system requirements. This presents a more efficient means of gathering data for decision making and presentation purposes.

The requirement to post various reports to facilitate presentations and command briefings permitted the user to view current and historical information available regarding operational status, MICAP data, funding and product improvements. The ability to view and post these reports provided the user with a more cohesive and collaborative display of information to assist decision support.

AFSPC users have never before had the ability to present the information in one dynamic view that the VSLRC offers. Users have always been required to view disparate data systems and "self-merge" information. Because of this, data inconsistencies were presented, effective decision making threatened and an increase in man-hours (and associated costs) realized through the manual generation and distribution of reports and presentations.

The VSLRC has provided users with an effective decision making tool, has streamlined logistics processes and increased efficiencies. The advanced tools it utilizes for GUI displays have enabled users to intuitively access system components and perform functions with no user training required.

4.1 TECHNICAL IMPLEMENTATION

A high degree of collaboration and coordination was involved in the technical implementation and deployment of VSLRC. The VSLRC application was originally slated to reside on the CCIC2S infrastructure; however, through communications with system operators, developers and the ESC/ND community it was determined that this would not occur in an efficient and cost effective manner. Therefore, through contact from Space and Missile Center (SMC)/LGX to the J65 (C4 Systems - coordinates, facilitates, monitors and assesses systems, networks and communications requirements) Designated Accreditation Authority (DAA), USSTRATCOM was able to host VSLRC on their SDSS infrastructure. SDSS is compatible with the core CCIC2S infrastructure requirements, posing minimal risk, if any, for future relocation and/or application development. A Software Installation Plan (SIP) was developed and on-site support provided for most releases in order to provide installation and configuration procedures for successful application deployment.

With VSLRC housed on SDSS, it was necessary to develop an interface with MCRS, which resides on the CCIC2S infrastructure, in order to obtain near real-time updates of satellite constellation OPSCAP status. This interface was analyzed and coordinated with CCIC2S and MCRS personnel. A simulated MCRS environment was installed on a government furnished equipment (GFE) laptop for design, development and unit testing purposes. Extensive testing of the interface was also accomplished via the AFRL SIPRNET facility.

5 Conclusions

The current successful implementation of the VSLRC illustrates that future iterative software development releases will bring great opportunities for progress, increasingly enabling the entire AF Space Community to employ, manage and sustain Space assets more efficiently and effectively. The VSLRC will continue to align the AF Space Community's understanding of the real-time status and long-term health of Space systems worldwide and eliminate duplication in analysis, data entry and reporting. Further technological implementation will allow VSLRC to alert members of the supply chain – all the way to the system user – of logistics problems that may impact operations. Future efforts will continue to streamline logistics support and sustainment by integrating information from disparate information systems and alerting key individuals to gaps within the logistics systems.

The VSLRC has also effectively demonstrated the value of implementing core screens which take advantage of cutting edge visualization techniques. The current VSLRC screens give users timely, easy access to the most critical information with a minimal amount of effort. As users were involved in the evaluation of the effectiveness of these visualization techniques and the creation of the screens, the user acceptance level and positive feedback toward the VSLRC is extremely high.

Previous to the availability of the VSLRC, users had to reference many sources and piece together critical data to make decisions. The need for collaboration and reliance upon contacting others for information was high. With the VSLRC, users simply access one central tool that provides access to all pertinent data.

For instance, the VSLRC's direct interface with the Mission Critical Reporting System (MCRS) provides invaluable operational status information about satellite constellations to AFSPC users which were previously unavailable from a single source. This OPSCAP data pull has prototyped the technological ability to receive near real-time data interfaces from source systems which provide the user with automatic status updates. The capability has also created a baseline for additional future technological advances in intelligent agent alert systems and additional source system interfaces.

Before the VSLRC, users used different formats for situational awareness reports that did not support sharing information easily. Since the VSLRC, reporting formats have been standardized and the VSLRC is used as the preferred tool for sharing data.

To date, the revolutionary communications channels and situational awareness capabilities provided by the VSLRC have proven to be a great success story for the AF Space Community, and the potential to build upon this established platform is great.

6 Recommendations

The implementation of VSLRC has continued to ripple throughout the AFSPC community. On 14 October 2005, MGen William Shelton, 14th AF/CC, was provided a briefing and live demonstration of VSLRC. MGen Shelton saw many opportunities for the VSLRC in the operations community and directed SMC/LGX to take the presentation to the Wing Commanders to obtain user requirements for further development and potential funding.

Additional potential enhancements include the following:

- Role-based alerts that will notify users that a condition exists that may require immediate or fast attention, and are meant to inform as well as promote action.
- Display performance measures and trends over time that indicates the health of each system, potential short- and long-term problems, and ways of taking corrective action.
- Visibility of logistics and maintenance impacts on operational readiness.
- Collection of maintenance and logistics data that support metrics calculation.
- Drill-down from equipment status to underlying causes.
- Track and store actions being taken to solve logistics problems as they pertain to systems, components, items, etc.
- Information/diagnostic screens that integrate data from multiple Air Force, other DoD, and contractor legacy information and analytical systems.
- Three-dimensional map view to show precise longitude and latitude (or GPS coordinates) coordinates for each location with day/night shading.
- Ability to bi-directionally transfer information across security domains with the utilization of a guard processor.
- Ability to utilize a collaborative workspace and "chat" capability within the VSLRC resident on the SIPRNET.

With any system integration effort there exist data "gaps" where data owned and/or provided by contractor or other services is difficult to obtain or integrate within the foundation of an existing system. Future enhancements to the VSLRC will depend on key data elements from contractor/other services and legacy systems, which may require additional communication tiers to gather the necessary data. Transition between classified and unclassified environments and any C2 guards or other mechanisms for providing this data will need to be explored.

Access to Government-owned data sources (e.g., Core Automated Maintenance System (CAMS), AFKS, Standard Base Supply System (SBSS), etc.) will also be required for future data collection. Therefore, it may be necessary that the VSLRC obtain the appropriate access to such data in real time status in order to provide the user with the most accurate and updated information as possible.

Business rules must be established for the identification of Operations Capability (OPSCAP), Systems Capability (SYSCAP), FMC, PMC, and NMC statuses in order for the VSLRC to further calculate and identify the appropriate condition to the various echelons of the AFSPC.

7 References

Paul Salmon, Prof Neville Stanton, Dr Chris Baber, Dr Guy Walker, Dr Damian Green; Defense Technology Center Publication , “Human Factors Design & Evaluation Methods Review” 3

Additional Suggested References:

a) *Virtual Space Logistics Readiness Center (VSLRC) Phase II, Technical Report – Study/Services – Migration Strategy Functional and Technical Design, 25 May 2004*

b) *Virtual Space Logistics Readiness Center (VSLRC) Change Control Procedure and Flow, dated 7 Dec 2004*

c) *Technical Report - Concept of Operations (CONOPs) for the Virtual Space Logistics Readiness Center (VSLRC), 8 August 2003*

d) *Virtual Space Logistics Readiness Center (VSLRC) Software Design Description, 07 October 2005, Version 3.0.0.7*

Appendix A
VSLRC Symbols, Abbreviations, and Acronyms

14AF 14th Air Force
2SOPS 2nd Satellite Operations Squadron
50SW 50th Space Wing
88XR - 88lbs. Extensible Racks (another type of receive suite)

--A--

A&T Acquisition and Testing
ACTD Advanced Concept Technology Demonstration
ACU Antenna Control Unit
ADP Automated Data Processing
ADPE Automated Data Processing Equipment
AEP Architecture Evolution Plan
AF Air Force
AFRL Air Force Research Laboratory
AFRS - Air Force Receive Suite
AFKS Air Force Knowledge Service
AFMC Air Force Materiel Command
AFRL Air Force Research Laboratory
AFSAT Air Force Satellite
AFSCN Air Force Satellite Control Network
AFSCP Air Force Space Command
AFSOC Air Force Special Operations Command
AFSPACE Air Force Component of U.S. Space Command (14th Air Force)
AFSPACECOM Air Force Space Command
AFSPC Air Force Space Command
AFWA Air Force Weather Agency
AHF Adaptive High Frequency
ALC Air Logistics Center
AMCS Alternate Master Control Station
AMS Ascension Monitor Station
Ao Operational Availability
AOC Air and Space Operations Center
ARS Action Report System
ARTS Automated Remote Tracking Station
ATM Asynchronous Transfer Mode

--B--

BMEWS Ballistic Missile Early Warning System
BVI Battlespace Visual Initiative

--C--

C2 Command and Control
C2S Command and Control Systems
C3 Command, Control, and Communications

C3I Command, Control, Communications, and Intelligence
C4 Command, Control, Communications and Computers
C4I Command, Control, Communications, Computers, And Intelligence
C4ISP Command, Control, Communications, Computers, And Intelligence Support Plan
C4ISR Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
C&A Certification and Accreditation
CA California
CAMS Core Automated Maintenance System
CCAFS Cape Canaveral Air Force Station
CCAS Cape Canaveral Air Station
CCIC2S Combatant Commander Integrated Command and Control System
CCS Command and Control System/Segment; Change Control Sheets
CCSC Command and Control System Center
CDR Critical Design Review
CDRL Contract Data Requirements List
CE Communications-Electronics
CISF Centralized Integrated Support Facility
CNS communications, navigation, surveillance
CONOPS Concept of Operations
CONUS Continental United States
COTS Commercial Off The Shelf
CPCA Camp Parks Communications Annex
CRS Command Readout Station
CSO Chief Sustainment Officer
CTA Cognitive Task Analysis
CTIS Combat Transport Information System
CTS Colorado Tracking Station
CUE Common User Element
CVNS carrier navigation systems

--D--

DAA Designated Accreditation Authority
DC Document Changes
DGS Diego Garcia Tracking Station
DISA Defense Information Systems Agency
DISS Digital Ionospheric Sounding System
DLA Defense Logistics Agency
DLT Data Link Terminal
DMSP Defense Meteorological Satellite Program
Do Operational Dependability
DoD Department of Defense
DR Discrepancy Reports
DSCS Defense Satellite Communications System
DSD Data System Designator
DSP Defense Support Program; Defense Standardization Program

--E--

EAM Emergency Action Message
EAR Enterprise Archives
EDLM Emergency Depot Level Maintenance
EDW Enterprise Data Warehouse
EHF Extremely High Frequency
ER Enhancement Requests
ERD Entity Relationship Diagram
ERGS European Remote Ground Stations
ETRO Estimated Time to Return to Operation
EVCF Eastern Vehicle Checkout Facility

--F--

FMC Fully Mission Capable
FTP File Transfer Protocol

--G--

GA Ground Antenna
GAS-1 GPS Antenna System -1
GBS Global Broadcast Service
GCCS Global Command and Control System
GCSS Global Combat Support System
GEO Geosynchronous Earth Orbit
GEODSS Ground-Based Electro Optical Deep Spaced Surveillance System
GFE Government Furnished Equipment
GIDEP Government Industry Data Exchange Program
GM Ground Mobile Satellite Control
GO Geostationary, never move
GPS Global Positioning System
GPSE GPS Enhancement
GSSC Global Satcom (Satellite Communications) Support Center
GTS Guam Tracking Station
GUI Graphical User Interface

--H--

HAF Headquarters Air Force
HEO Highly Elliptical Orbit
HI Hawaii
HQ AFSPC Headquarters Air Force Space Command
HQ USAF Headquarters United States Air Force
HQ AFRC Headquarters Air Force Reserve Command
HTS, HTS HARM Targeting System Hawaii Tracking Station

--I--

ICBM Intercontinental Ballistic Missile
ICP Inventory Control Point
IM Item Manager
IMS Ionospheric Measuring System
IOS Indian Ocean Tracking Station
ISST ICBM (Intercontinental Ballistic Missile) SHF (Super High Frequency) Satellite Terminal
ITWAA Integrated Tactical Warning and Attack

--J--

J2EE Java 2 Platform, Enterprise Edition
JAAS Java Authentication and Authorization Service
JAD Joint Application Design
JAR Java Archives
JDK Java Development Kit
JFCOM Joint Forces Command
JRE Java Runtime Environment
JSP Java Server Pages
JTA Joint Technical Architecture
JVM Java Virtual Machine

--K--

KMS Kwajalein Monitor Station

--L--

LAAFB Los Angeles Air Force Base
LAT latitude
LD/HD Low Density/High Demand
LRC Logistics Readiness Center

--M--

m Meter
MAJCOM Major Command
MARK IVB Meteorological Data Station
MCRS Mission Critical Reporting System
MCS Master Control Station (GPS); Mission Control Segment
MCV Milstar or Mobile Communications Vehicle
MDT Mean Down Time; Mobile Data Terminal (GPS)
ME Mission Effectiveness
MEECN Mission Essential Emergency Communications Network
MESL Mission Essential Subsystem List
MFHBF Mean Flight Hours Between Failure

MGS Mobile Ground Station
MILSATCOM Military Satellite Communications
MILSTAR Military Strategic and Tactical Relay System
MLDT Mean Logistics Delay Time
MLRS multiple launch rocket system
MLS Microwave Landing System
MLV Medium Launch Vehicle (i.e., Delta II)
mm millimeter
MMP (Minute Man Mission Essential Emergency Communications Network (MEECN) Program
MMCCS MILSTAR Mobile Constellation Control
MOB Main Operating Base
MOC-V MILSTAR Operations Center Vandenberg
MS Monitor Station
MSRE Monitor Station Receive Equipment (GPS)
MTBCF Mean Time Between Critical Failures
MTBDE Mean Time Between Downing Events
MTBF Mean Time Between Failure
MTBMA Mean Time Between Maintenance Actions
MTTR Mean Time To Repair/Report
MTTRS Mean Time To Repair System
MTTRF Mean Time to Restore Function
MV Mission Vehicle

--N--

N/A Not Applicable
NAF Numbered Air Force; Non-Appropriated Fund
NHS Hew Hampshire
NIU Network Interface Unit
NMC Non-Mission Capable
NOFORN No Foreign Dissemination
NPF NAVSTAR Processing Facility (GPS)
NRO National Reconnaissance Office
NS Sustainment Normalization
NSN National Stock Number

--O--

OAFS Onazuka Air Force Station
OAS Onizuka Air Station; open architecture system
OCR Optical Character Recognition
OCS Operational Control Segment
OCT Operational Climatic Testing
OO-ALC Ogden Air Logistics Center
OPSCAP Operational Status Capability

--P--

PACAF Pacific Air Forces
PAFB Peterson Air Force Base, Colorado Springs, CO
PARCS Perimeter Attack Radar Characterization System
PAWS Phased Array Warning System
PDR Preliminary Design Review
PGSE Payload Ground Support System
PIP/SBM - Primary Injection Point / Satellite Broadcast Manager
PLRS Position Location Reporting System
PMC Partially Mission Capable
PMI Preventive Maintenance Inspection
PPS Precise Positioning Service (GPS); Post-Production Support
PRGS Pacific Remote Ground Stations

--Q--

QSR Quarterly Status Report

--R--

RDBMS Relational Database Management System
REMIS Reliability and Maintainability Information System
RF Radio Frequency
RIMS Radio Interference Measuring System
RSSC Regional SATCOM Support Centers
RSTN Radio Solar Telescope Network
RTS Remote Tracking Station
RUP Rational Unified Process

--S--

SAFB Schriever Air Force Base (Colorado)
SATCOM Satellite Communications
SBIR Space Based Infrared System; Small Business Innovation Research Program
SBIRS Space Based Infrared System
SBMCS Space Based Management Core System
SBSS Standard Base Supply System
SCINDA Scintillation Network Decision Aid
SCS Security Control System
SCT Single Channel Transponder
SCTIS Single Channel Transponder Injector Subsystem
SCTS Single Channel Transponder System
SCOPES Space Common Operating Picture Exploitation System
SDLC Software Development Life Cycle
SDSS Strategic Decision Support System
SEICS Space Environment Ionospheric Characterization System
SEON Solar Electro-Optical Network

SESS Space Environment Support System
SIP Software Installation Plan
SIPRNET Secure Internet Protocol Network
SISP Single Integrated Space Picture
SITREP Situation Report
SLS Satellite Launch Squadron
SMC Space and Missile Systems Center (AFMC)
SMC/CC Space and Missile Systems Center Commander
SMCS Satellite Mission Control Subsystem
SMC/CZ GPS Joint Program Office
SOC Satellite Operations Center; Space Operations Center
SOON Solar Observing Optical Network
SOPS Satellite Operations Squadron
SOW Statement of Work
SPADOC Space Defense Operations Center
SPM System Program Manager; Software Programmer's Manual
SPR Software Problem Reports
SPS Standard Positioning Service (GPS); Software Product Specification
SRD Software Requirements Description
SRS Satellite Reference System; Software Requirements Specification; Solar Radio Spectrograph; Shipboard Receive Suite
SSL Secure Sockets Layer
SSLC2 Smart Systems for Logistics Command and Control
SSM – System Support Manager
SSN Space surveillance network
SSRS - Sub-surface Receive Suite
SSSWG Space Systems Sustainment Working Group
STS Space Transportation System
STSS Space Track Surveillance System
STT Small Tactical Terminal
SYSCAP Systems Capability

--T--

Tacterms Tactical Terminals
TCS Tracking and Commanding Station
TGA Transportable Ground Antenna
TIPs - Theater Injection Point
TSTS Telecommunications Simulator Test Station/String
TTS Thule Tracking Station
TVCF-E Transportable Vehicle Checkout Facility - East

--U--

U Unclassified
UCC Unified Combat Command
UDLM Urgent Depot Level Maintenance
UFO - UHF Follow-on Satellite
UHF Ultra High Frequency

UHFSATCOM Ultra High Frequency Satellite Communications
USAF United States Air Force
USSPACECOM United States Space Command
USSTRATCOM United States Strategic Command

--V--

VAFB Vandenberg Air Force Base
VSLRC Virtual Space Logistics Readiness Center
VTS Vandenberg Tracking Station

--W--

WAR Web Archives
WPMDS Weather Processing Message Distribution System
WSMIS Weapon System Management Information System

--X--

x times